Photographic Action of Printer's Ink.

IN your issue dated April 28, I notice an article reporting the Bakerian Lecture given by Dr. W. J. Russell.

One paragraph states that printing ink *at a distance* will act upon a photographic film. Is that the explanation of the following curious circumstance?

An Ilford ordinary plate, which I had kept in its box unopened for five years, was exposed recently upon a poorly-lighted subject; upon development I found, instead of my subject, the matter of the advertisement which was upon the outside wrapper. This came up strong and quickly, but nothing was seen of the subject upon which the plate had been exposed in the camera.

The image was a positive, and the large type word "Ilford" was very prominent.

So it would appear that the sensitised plate had been acted upon by the printer's ink, through the lid of the box and three wrappers of paper, two of which were brown.

W. TRUEMAN TUCKER.

Parkside, Loughborough, May 8.

A VERY interesting result. The picture no doubt arose from the printer's ink, and it shows what great length of time will do. The plate must have been face upwards. W. J. R.

May 9.

Electrical Impressions on Photographic Plates.

SOME simple variations of the inductoscript may be of general interest.

A photographic glass negative is placed on a plate, and a ¾-inch induction coil is sparked for one or two minutes on the outsides: a perfect positive with fine detail can be developed.

If printed paper is so treated, a clear image of the reading is made, white letters on a dark ground: a coin gives dark letters.

If the exposure to the spark is prolonged, an indistinct image of the print, which is on the other side of the paper, will also appear.

More or less perfect images can be made, if ink or pencil writing or a photographic print be put on the plate. When thin paper is placed between a coin and a plate, a fair, but less perfect, reproduction of the coin will be produced.

It makes very little difference whether fast or slow plates are employed. A. S. BATES.

Winchester College.

Bacteria on an Ancient Bronze Implement.

A FEW days ago an ancient bronze implement was brought to me showing small excrescences, the centres of rapid oxidisation, which the owner told me had only very recently developed.

On examining the material scraped off one of these excrescences under the microscope with fairly high powers (a ¼ inch and 1/7 inch objective), it was found to be swarming with bacteria, which seemed to be the cause of the rapid oxidisation. I have not been able to trace any reference to bacteria inhabiting a similar nidus, and I should be much obliged to any correspondent who could direct me to the literature on the subject, and inform me of the best way of sterilising the implement without injury. WM. EDWARD NICHOLSON.

Lewes, May 3.

THE ROYAL SOCIETY SELECTED CANDIDATES.

THE following are the names and qualifications of the fifteen candidates selected by the Council of the Royal Society, to be recommended for election into the Society this year:—

HENRY FREDERICK BAKER,

M.A., Fellow and Lecturer of St. John's College, Cambridge; University Lecturer in Mathematics. Author of "A Treatise on Abel's Theorem and the Allied Theory" (1897); and of the following papers, among others: — "Weierstrassian Formulæ applied to the Binary Quartic and Ternary Cubic" (*Quart. Journ. Math.*, vol. xxiv., 1889); "Gordon's Series in the Theory of Forms" (*Messenger Math.*, vol. xix., 1889); "The Full System of Concomitants of Three Ternary Quadrics" (*Camb. Phil. Soc. Trans.*, vol. xv., 1889); "The Application of Newton's Polygon to the Singular Points of Algebraic Functions" (*ibid.*, vol. xv., 1893); "On Euler's ϕ-Function" (*Proc. Lond. Math. Soc.*, vol. xxi., 1890); "Fundamental Systems for Algebraic Functions" (*ibid.*, vol. xxvi., 1895); "On Noether's Fundamental Theorem" (*Math. Annalen.*, vol. xlii., 1893); "On a Geometrical Proof of Jacobi's I-Function Formulæ" (*ibid.*, vol. xliii., 1893); "On the Theory of Riemann's Integrals" (*ibid.*, vol. xlv., 1894); "The Practical Determination of the Deficiency and Adjoint ϕ-Curves for a Riemann Surface" (*ibid.*, vol. xlv., 1894); "On a Certain Automorphic Function" (*Camb. Phil. Soc. Proc.*, vol. viii., 1895); "On the Hyper-elliptic Sigma-Functions" (*Amer. Journ. Math.*, vol. xx., 1897).

ERNEST WILLIAM BROWN,

Professor in Haverford College. Formerly Fellow of Christ's College, Cambridge. Author of the following papers:—In the *American Journal of Mathematics*—"On the Part of the Parallactic Inequalities in the Moon's Motion, which is a Function of the Mean Motions of the Sun and Moon" (vol. xiv., pp. 141–160, 1892); "The Elliptic Inequalities in the Lunar Theory" (vol. xv., pp. 244-263, 321-338, 1893); "Investigations in the Lunar Theory" (vol. xvii., pp. 318-358, 1895). In the *Monthly Notices Royal Astronomical Society*—"On the Determination of a Certain Class of Inequalities in the Moon's Motion" (vol. lii. pp. 71-80, 1891); "Notes on Lunar Theory" (vol. lii. pp. 408-9, 1892; liv. p. 471, 1894; lv. pp. 3-5, 1894); "Note on Hansen's Lunar and Planetary Theories" (lvi. pp. 52-3, 1895); "Note on Mr. Stone's paper, 'Expressions for the Elliptic Coordinates of a Moving Point to the Seventh Order of Small Quantities,'" 1896. In the *Proceedings Cambridge Philosophical Society*—"On the Part of the Parallactic Class of Inequalities in the Moon's Motion which is a Function of the Ratio of the Mean Motions of the Sun and Moon" (vol. vii. pp. 220-1, 1891). Before the London Mathematical Society, November 1896—On "The Application of Jacobi's Dynamical Method to the General Problem of the Three Bodies"; "On Certain Properties of the Mean Motions, and the Secular Accelerations of the Principal Arguments used in the Lunar Theory." Author of "An Introductory Treatise on the Lunar Theory" (Cambridge University Press, 1896, pp. viii.-292).

Supplementary Certificate.—"On the Mean Motions of the Perigee and Node"; "On the Theoretical Values of the Secular Accelerations of the Lunar Theory"; "Note on the Mean Motions of the Perigee and Node," in the *Monthly Notices R. Astron. Soc.*, 1897; "Theory of the Moon, containing a New Calculation of the Coordinates of the Moon in Terms of the Time" (Part I.-IV. *Memoirs R. Astron. Soc.*, vol. liii., 1897, pp. 39-116).

ALEXANDER BUCHAN,

M.A., LL.D., F.R.S.E. Secretary, Scottish Meteorological Society, from 1860. Member of the Meteorological Council from 1873. Author of the following contributions to Meteorology: "Mean Atmospheric Pressure and Prevailing Winds of the Globe and Handy Book of Meteorology," 1868; "Weather and Health of London," jointly with Sir Arthur Mitchell, 1875; "*Challenger* Report on Atmospheric Circulation in 1889"; "*Challenger* Report on Oceanic Circulation in 1895"; "Specific Gravities and Oceanic Circulation in 1896"; "Meteorology," in the "Encyclopædia Britannica"; Reports on the Meteorology of Ben Nevis, &c.

SIDNEY FREDERIC HARMER,

M.A., Superintendent of the University Museum of Zoology, and Fellow of King's College, Cambridge. Engaged for many years in researches in Embryology and Comparative Anatomy. Discoverer of important facts connected with the Anatomy of Cephalodiscus, which largely assisted in fixing its systematic position; and of the occurrence of a process of extensive Embryonic Fission in certain Polyzoa. Author of numerous papers on zoological subjects, including the following:—"On the Structure and Development of *Loxosoma*" (*Quart. Journ. Micros. Sci.*, vol. xxv., 1885); "On the Life-history of Pedicellina" (*ibid.*, xxvii., 1887); "On the British Species of *Crisia*" (*ibid.*, xxxii., 1891); "On the Nature of the Excretory

Processes in Marine Polyzoa" (*ibid.*, xxxiii., 1892); "On the Occurrence of Embryonic Fission in Cyclostomatous Polyzoa" (*ibid.*, xxxiv., 1893); "Preliminary Note on Embryonic Fission in *Lichenopora*" (*Roy. Soc. Proc.*, lvii.); "Appendix to the *Challenger* Report on *Cephalodiscus*" (*Challenger* Reports, vol. xx.); "Sur l'Embryogénie des Bryozoaires Ectoproctes" (*Arch. de Zool.*, 1887); "Notes on the Anatomy of *Sinophilus*" (*Journ. Marine Biol. Assoc.*, 1889). Joint Editor of the Cambridge Natural History. Member of Council of the Marine Biological Association. Is attached to science, and anxious to promote its progress.

ARTHUR LISTER,

F.L.S. Distinguished for his researches on the Mycetozoa. Author of "Notes on the Plasmodium of *Badhamia utricularis* and *Brefeldia maxima*" (*Annals of Botany*, vol. ii., 1888, pp. 1–24, plates 1, 2); "Notes on *Chondrioderma difforme* and other Mycetozoa" (*ibid.*, vol. iv., 1890, pp. 281–298, plate 1); "Notes on the Ingestion of Food-material by the Swarm-cells of Mycetozoa" (*Journ. Linn. Soc.*, vol. xxv., Bot., 1890, pp. 435–441); "Notes on Mycetozoa" (*Journ. of Bot.*, vol. xxix., 1891, pp. 257–268, plates 308–312); "On the Division of the Nuclei in the Mycetozoa" (*Journ. Linn. Soc.*, vol. xxix., Bot., 1893, pp. 529–542, plates 35, 36); "Monograph of the Mycetozoa," being a descriptive Catalogue of the Species in the Herbarium of the British Museum (1894, pp. 224, plate 78); "Guide to the British Mycetozoa exhibited in the Department of Botany, British Museum" (1895, p. 42); "Notes on British Mycetozoa" (*Journ. Bot.*, vol. xxxiii., 1895, pp. 323–325); "A New Variety of *Enteridium olivaceum*" (*ibid.*, vol. xxxiv., 1896, pp. 210–212); "On Some Rare Species of Mycetozoa" (*ibid.*, vol. xxxv., 1897, pp. 209–218); and other memoirs.

CHARLES ALEXANDER MCMAHON,

Lieut.-General. Formerly Commissioner of the Amritsar Division, Punjab. President of the Geologists' Association and Vice-President of the Geological Society of London. Distinguished for his acquaintance with the sciences of Petrology and Geology. He was the first to demonstrate (discover), by study in the field, and with the microscope, the truly granitic origin of the "Granitoid Gneiss" of the N.W. Himalaya, thereby affording a conceivable interpretation of the mountain structure. See his numerous papers (23) in the "Records of the Geological Survey of India" (1876-87). Later, General McMahon has contributed much to the elucidation of the structure and origin of crystalline rocks and rock-making minerals, notably in his papers "On the Rocks of the Lizard" (*Quart. Journ. Geol. Soc.*, vol. xlv., 1889, and, conjointly with Prof. Bonney, in vol. xlvii., 1891); "On the Dartmoor Granite and its Relation to the Surrounding Rocks" (*ibid.*, vol. xlix., 1893); "On Micro-chemical Analysis of Rock-making Minerals" (*Min. Mag.*, vol. x., p. 79); and "On Optical Characters of the Globules and Spherulites of Lithium Phosphate," &c. (*ibid.*, p. 229); and numerous minor papers in the *Geological Magazine* and the *Proceedings* of the Geologists' Association.

WILLIAM OSLER,

M.D., F.R.C.P. Professor of Medicine in the Johns Hopkins University and Physician-in-Chief to the Johns Hopkins Hospital, Baltimore; formerly Professor of the Institutes of Medicine, McGill College, Montreal; and Professor of Clinical Medicine in the University of Pennsylvania, Philadelphia. Has been during many years actively engaged in the advancement of scientific medicine, and has published a large number of communications, some of great interest and importance, chiefly dealing with clinical and pathological matters. Of these only a very few can be here enumerated, viz.: "On the Systolic Brain Murmur of Children" (*Bost. Med. and Surg. Journ.*, 1880); "Infectious Endocarditis" (*Arch. of Med.*, 1881, and Congr., London, 1881); "On Certain Parasites in the Blood of the Frog" (*Canada Naturalist*, 1882); "The Gulstonian Lectures on Malignant Endocarditis" (*Lancet*, 1885); "On the Morbid Anatomy of Typhoid Fever" (*Canada Med. and Surg. Journ.*, 1885); "On Certain Problems in the Physiology of the Blood Corpuscles" (*Phil. Med. News*, 1886); "The Relation of the Corpuscles to Coagulation Thrombosis" (*Brit. Med. Journ.*, 1886); "The Bicuspid Conditions of the Aortic Valves" (*Trans. Assoc. Amer. Physicians*, 1886); "The Cardiac Relations of Chorea" (*Amer. Journ. Med. Sci.*, 1887); "The Cerebral Palsies of Children" (*Med. News*, 1888); "On the Situation of the Anovesical Centre in Man" (*ibid.*); "On Phagocytes" (*ibid.*, 1889); "On Intrathoracic Growths from the Thyroid Gland" (*ibid.*); "Filaria Sanguinis Hominis" (*Johns Hopkins Bull.*, 1890); "On the Amœba Coli" (*ibid.*, 1890); "On Sensory Aphasia" (*Amer. Journ. Med. Sci.*, 1891); "On Typhoid Fever" (*Johns Hopkins Reports*, 1893 and 1894); "On Abdominal Tumours" (1894); "On Addison's Disease" (*Int. Med. Mag.*, 1896). Is also the author of several important articles in systems of medicine, and of a well-known text-book "On the Principles and Practice of Medicine." Has long occupied a leading position in Canada and the United States as a scientific physician, and has also a European reputation as one of the foremost representatives of Clinical Medicine and Pathology of the day.

HON. CHARLES ALGERNON PARSONS,

M.A. (Camb.). Engineer. M.Inst.C.E. Eminently distinguished as an inventor and engineer. By his invention of the compound steam turbine he has made it practicable to use steam economically in an engine without reciprocating parts. He has adapted the steam turbine successfully to dynamo driving and other uses, and his recent application of it to marine propulsion is a new departure of particular interest. In developing his inventions he has shown much scientific knowledge and experimental skill. Author of a number of papers on the steam turbine, its theory and its applications, in *Proc. Inst. Mech. Eng.*, 1888; *Trans. of the North-East Coast Inst. of Engineers and Shipbuilders*, 1887; Inst. of Civil Engineers, Conference, 1897; *Trans. Inst. Naval Architects*, 1887; Inst. of Marine Engineering, 1897. Has investigated experimentally the action of high-speed screw propellers (*Trans. Inst. Nav. Arch.*, April 1897); also the "Behaviour of Carbon at High Temperatures and under Great Pressures" (*Proc. Roy. Soc.*, *Phil. Mag.*, September 1893).

THOMAS PRESTON,

M.A. (Dubl.). Professor of Natural Philosophy, University College, Dublin. Fellow of the Royal University of Ireland. Inspector of Schools under the Science and Art Department. Has published works that have much advanced the study of Light and Heat. Author of treatise on "The Theory of Light" (Macmillan, 1890); and of one on "The Theory of Heat" (Macmillan, 1894); and of Memoirs "On the Motion of a Particle and the Equilibrium of a String on a Spherical Surface" (*Trans. Roy. Irish Acad.*, vol. xxix., 1889), and "On the Mass Inversion of Centrobaric Bodies" (*Proc. Roy. Dubl. Soc.*, 1887).

EDWARD WAYMOUTH REID,

M.B. (Cantab.), B.A. Professor of Physiology, University College, Dundee. Distinguished as a Physiologist, especially in inquiries relating to absorption and secretion, and to electromotive phenomena. Published the following papers on electromotive phenomena:—"On the Action of the Excised Mammalian Heart" (with Dr. Waller) (*Phil. Trans. Roy. Soc.*, 1887); "On the Process of Secretion in the Skin of the Common Eel" (*ibid.*, 1893, and *Journ. Physiol.*, 1894); "The Electromotive Properties of the Skin of the Common Eel" (*ibid.*, 1894); "Electromotive Phenomena of the Iris" (*Journ. Physiol.*, 1895). Also papers on osmose, absorption, and secretion in *Journ. Physiol.*, 1890, 1893, 1895–96.

ALEXANDER SCOTT,

M.A. (Cantab.), D.Sc. (Edin.), F.R.S.E., F.C.S. Late Assistant to the Jacksonian Professor of Experimental and Natural Philosophy. Distinguished by having paid great attention to the exact determination of atomic weights and of combining proportions by volume. Author, in conjunction with Prof. Dewar, of papers on the Vapour Densities of Potassium and Sodium; on the Atomic Weights of Manganese, Oxygen, and Silver; and on the Molecular Weights of substituted Ammonias, published in the *Proceedings of the Royal Society*. Author of papers on Vapour Densities at High Temperatures, and on the Composition of Water by Volume, the last published in the *Phil Trans.*, vol. clxxxiv. Author of a text-book entitled "Introduction to Chemical Theory" (A. and C. Black, 1891).

Albert Charles Seward,

M.A. (Cantab.), F.G.S. University Lecturer in Botany, Cambridge. Has made extended researches in Fossil Botany, the results of which have been published in a series of papers and works, of which the following may be specified:—That on the Wealden Flora gives, for the first time, a critical and comprehensive view of the vegetation of this important geological period, and in many respects enlarges and modifies our previous knowledge of the subject: "On *Calamites undulatus*" (*Geol. Mag.*, vol. v., 1888); "Notes on *Lomatophloios macrolepidotus*, Goldg." (*Proc. Camb. Phil. Soc.*, vol. vii., 1890); "Fossil Plants as Tests of Climate" (Sedgwick Prize Essay for 1892); "On the Genus *Myeloxylon*, Brong." (*Annals of Botany*, vol. vii., 1893); "On *Rachiopteris Williamsoni*, sp. nov., a new Fern from the Coal Measures" (*ibid.*, vol. viii., 1894); "Catalogue of the Mesozoic Plants in the Department of Geology, British Museum (Nat. Hist.)"; "The Wealden Flora, Part I., *Thallophyta* to *Pteridophyta*. Part II., Gymnospermæ" (1894-95).

William Ashwell Shenstone,

F.I.C., Senior Science Master in Clifton College. Member of Council of the Chemical Society. Distinguished for his skill as an experimenter, for his ability as a teacher, and for his zeal in the introduction of improved methods of teaching physical science as a branch of general education. Author of the following and other papers:—"Ozone from Pure Oxygen" (*Journ. Chem. Soc.*, 1887); "The Volumetric Relation of Ozone and Oxygen," "The Influence of Temperature on the Composition and Solubility of Hydrated Calcium Sulphate and Calcium Hydroxide" (*Journ. Chem. Soc.*, 1888); "Some Improved Vacuum Joints and Taps" (*ibid.*, 1890); "Platinous Chloride as a Source of Chlorine," "The Adhesion of Mercury to Glass in the presence of Halogens" (*Journ. Chem. Soc.*, 1892); "On preparing Phosphoric Anhydride free from the Lower Oxides of Phosphorus," "Studies on the Formation of Ozone from Oxygen," Part II. (*Journ. Chem. Soc.*, 1893). Also author of the article on Ozone in the current edition of Watts' Dictionary; "A Practical Introduction to Chemistry" (Rivington, 1886); "The Methods of Glass Blowing" (Rivington, 1886); Life and Work of Liebig" (Century Series, Cassell, 1895).

Henry Martyn Taylor,

Barrister-at-Law. Fellow of Trinity College, Cambridge. Formerly Tutor of Trinity College, Cambridge. Third Wrangler and Second Smith's Prizeman in 1865. Author of papers in the *Mathematical Messenger*, as follows:—Vol. iii. p. 189, "Geometrical Explanation of the Equations for the Longitude of the Node and the Inclination of the Orbit"; vol. v. p. 1, 1876, "On the Generation of Developable Surface through Two given Curves"; vol. vii. p. 22, 1877, "On Certain Series in Trigonometry"; vol. vii. p. 145, 1877, "On the Porism of the Ring of Circles touching Two Circles"; vol. xi. p. 177, "On a Six-point Circle connected with a Triangle"; vol. xiii. p. 145, "On a Cubic Surface"; vol. xvi. p. 39, "On a Geometrical Interpretation of the Algebraical Expression which, equated to Zero, represents a Curve or a Surface"; vol. xvi. p. 143, "Extension of an Inversion Property." In the *Proceedings* London Mathematical Society: Vol. v. p. 105, 1874, "Inversion, with Special Reference to the Inversion of an Anchor Ring or Torus"; vol. xiii. p. 102, "A Geometrical Theorem concerning the Division of a p-gon into n-gons (with R. C. Rowe); vol. xv. p. 122, "The Relations of the Intersections of a Circle with a Triangle"; vol. xx. p. 422, a Geometrical note "On the Developable Surface through Two Conics Inscribed (or Escribed) in Two of the Faces of a Tetrahedron." In the *Quarterly Journal of Mathematics*: Vol. xxiv. p. 55, "On the Centre of an Algebraical Curve"; vol. xxvi. p. 148, "Orthogonal Conics"; vol. xxvi. p. 214, "Orthogonal Quadrics." In the *Philosophical Magazine*: Vol. l. p. 221, 1876, "On the Relative Values of the Pieces in Chess." *Philosophical Transactions*, vol. clxxxv. pp. 37-69, 1894, "On a Special Form of the General Equation of a Cubic Surface"; and "On a Diagram representing the Twenty-seven Lines on the Surface." Writer of the article on Geometrical Conics in the last edition of "Encyclopædia Britannica," editor of "Elements of Euclid" for the Syndics of the Cambridge University Press; author of two treatises—"On Great-Circle Sailing"; "On a Method by which a Steamer's Lights might show her Course."

James Wimshurst.

Member of the Consultative Staff, Board of Trade. Qualifications: (1) Improvements in Electrical Influence Machines, which are now universally approved and adopted by Physicists; (2) an Influence Machine which gives charges of electricity, alternating from positive to negative with each rotation of the disc (in this type the glass discs, without any metal upon them, are freely self-exciting); (3) has delivered a lecture upon Influence Machines at the Royal Institution, April 27, 1888, and read papers at the Physical Society, April 17, 1891, and June 22, 1893.

THE FLOW OF WATER.

MORE than one hundred years ago, the French philosopher Coulomb caused a disc suspended by a torsion wire to oscillate in a vessel of liquid, and he thus ascertained that the resistance to various bodies under such circumstances, when the movement is a slow one, varies directly as the velocity of the motion. This law of resistance, it should be noted, is quite contrary to that of the friction between solid bodies as investigated by General Morin. Colonel Beaufoy, Froude, and others, however, found that, at higher velocities, the resistance varied more nearly as the square of the velocity. The difference of the two conditions in which the variation was directly, or, as the higher power, undoubtedly represented on the one hand the condition of water in which the mere viscosity came into play, resisting the shearing stress of the layers in passing over each other, and on the other hand the condition when the breaking up of the water into eddying motion caused the resistance to become much greater.

Prof. Osborne Reynolds, about 1883, investigated the critical velocity at which this change of state occurs, and gave calculations concerning the critical velocity, accompanied by an account of some beautiful experiments. These experiments showed the sudden breaking up at the critical velocity of the stream in a glass tube, the water in which had been flowing quite steadily until that particular velocity was reached.

Now with water flowing in a tube or channel with wetted sides the velocity is greatest in the middle, and, according to the generally accepted theory, is zero at the sides. If this be the case, it would seem that in no event can the whole body of water in the tube break up into sinuous motion; for it is evident that, although it is possible to have one of the conditions by itself, viz. the condition of lower velocity and parallel flow, it is not possible to have the other condition by itself, viz. the condition of sinuous flow. This leads irresistibly to the conclusion that at some point or other there must be a surface of separation between the two.

Such a surface of separation obviously requires special means in order to make it visible. When colouring material is introduced into water flowing under ordinary conditions, it mixes up at once throughout the whole mass. If, however, air is injected into the water, it has been recently found that, in the portion in which the sinuous state exists, the small particles of air, which appear when viewed by the eye as a sparkling mass, prevent the transmission of light and reveal on a screen, when a special lantern apparatus is employed, the actual behaviour of the flowing water. Figs. 1 and 2 show a rectangular body placed in the stream under such conditions. The lines of flow in Fig. 2 result from the use of slightly soapy water, which is used for the production of air bubbles; whereas in Fig. 1 the air is injected into perfectly clear water, and larger bubbles are consequently formed.

Now, if the above figures are examined, it will be seen that round each there is a clear border line indicating a condition differing from that in the